



## Symposium

PSE-NL Summer Symposium

# *Multiscale perspective on plastic recycling*

Friday June 30<sup>th</sup> 2023  
from 12:30 to 18:00

at **Delft University of Technology** and **MS-Teams**

These are PSE-NL's industrial members:



**FLUOR**<sup>®</sup>



**Process Systems Engineering NL** is a knowledge network that aims to offer a platform for sharing the best practices and scientific advancements in the PSE area. The systems approach has a strong track record of usage in industry to improve the decision making, to optimize plant configurations, chemical process conditions, molecular synthesis routes, and to control biological synthesis. The role of PSE is even more relevant now in the context of transition to bio-based raw materials and renewable energy. PSE-NL can help bolster the interests and careers of members, as well as initiating and carrying out industrial projects, making contributions to technology development and application projects with industry, while fostering academic research.

**Venue:** Delft University of Technology, [Applied Sciences \(TNW\) Building 58](#), Room A1.150  
Visiting address: Van der Maasweg 9, 2629 HZ, Delft

## Program:

<b>12:30 – 13:15</b>	<b>Lunch</b>
<b>13:15 – 13:30</b>	<b>Word of welcome (PSE-NL Chair)</b>
<b>13:30 – 14:00</b>	<b>Challenges in implementing advanced (chemical) recycling solutions</b> <i>by Dr. Ir. Tom Housmans, Fuenix Ecology, Prof. Tony Kiss, TU Delft</i>
	<i>If needed, 15 min time slot for questions, remarks, and short discussions</i>
<b>14:15 – 14:50</b>	<b>Pitch for each EngD thesis nominated for the Johan Grievink PSE Award</b> <i>by the nominees (~5 min each)</i>
<b>14:50 – 15:20</b>	<b>Selective particle control in suspensions using multiwavelength resonators: towards acoustophoresis on centimeter scale</b> <i>by Dr. Ir. Hakan Kandemir, PhD WUR – Johan Grievink PSE Award winner in 2022</i>
	<i>If needed, 5 min time slot for questions, remarks, and short discussions</i>
<b>15:20 – 15:40</b>	<b>Coffee break</b>
<b>15:40 – 16:10</b>	<b>Modelling chemical recycling technologies to promote circular plastics economies</b> <i>by Asst. Prof. Dr. Ir. Ana Somoza-Tornos, TU Delft</i>
	<i>If needed, 15 min time slot for questions, remarks, and short discussions</i>
<b>16:25 – 16:55</b>	<b>Recycling of plastics</b> <i>by Prof. Dr. Ir. Sascha Kersten, University of Twente</i>
	<i>If needed, 15 min time slot for questions, remarks, and short discussions</i>
<b>17:10 – 17:20</b>	<b>Announcement of the Johan Grievink PSE Award winner for an outstanding EngD thesis in PSE</b> <i>by the Chairmen of the Jury Committee</i>
<b>17:20 –</b>	<b>Closure and social event</b>

Please register your attendance by email at [pse-nl@outlook.com](mailto:pse-nl@outlook.com) before **Friday 23<sup>th</sup> June 14:00**. The participation fee is **25 EUR** for non-PSE-NL members - if attending the event at TU Delft, or 15 EUR via MS-Teams. [We highly encourage physical presence at TU Delft!](#)

## Abstracts

### **Modelling chemical recycling technologies to promote circular plastics economies** *by Asst. Prof. Dr. Ir. Ana Somoza-Tornos, TU Delft*

I will present two case studies where PSE methods can contribute to the scale-up of chemical recycling technologies to close the cycle of materials in the supply chains of plastics. In the first case, I will show the design of a process for the pyrolysis of polyethylene waste with the aim to increase the ethylene monomer recovery, including a complete techno-economic and life cycle assessments. The second case is related to oil production via hydrothermal liquefaction of polystyrene waste using lab-scale data. The resulting oil can be used in conventional processes to produce monomers, increasing the number options for equipment repurposing. I will discuss some of recent developments and wrap up some of the future challenges to achieve plastic circularity in industry.

### **Challenges in implementing advanced (chemical) recycling solutions** *by Dr. Ir. Tom Housmans, CTO at Fuenix Ecogy*

The presentation highlights the challenges that our society faces as it moves from a linear to a truly circular economy from the perspective of chemical recycling solutions. The audience will be guided through a story highlighting the major hurdles that new, innovative chemical recycling plants face in this transition. From feedstock specifications and availability to integration with existing infrastructure and assets down to even bringing products back to feedstock level. He will also highlight how modeling solutions can help in overcoming these hurdles at regional, national, and global level.

### **Recycling of plastics** *by Prof. Dr. Ir. Sascha Kersten, University of Twente*

The talk starts with setting the scene. How much and which plastics are produced at present? How much is recycled, and what are the goals for recycling in 2030 and 2050? What is the envisaged increase in plastic production in the coming decades? Secondly, scenarios for plastics recycling will be discussed and emphasis will be on how much crude intake can be reduced by recycling vs energy cost. The scenarios include mechanical recycling, pyrolysis and/or gasification as chemical recycling technologies. Finally, pyrolysis of waste plastic is discussed in detail. The whole route of waste collecting – sorting – cleaning – pyrolysis – cleaning – co-feeding in naphtha cracker is presented. Results of pyrolysis of DKR-350 are shown. We have gathered experimental results at 50 mg (batch), 0.1 kg (batch) and 5 kg (continuous) scale. Based on these data, conclusions will be drawn on how to move the pyrolysis route forward.

## Speakers

**Ana Somoza-Tornos** is Assistant Professor at TUDelft, Dep. of Chem. Eng. She earned her MSc in Chemical Process Engineering in 2016 and PhD in Process Systems Engineering in 2020, both from Polytechnic University of Catalonia. She works on developing PSE tools to address the closure of carbon cycles in the chemical industry. Her area of expertise is process modelling and design, mathematical optimization, techno-economic and life cycle assessment, and circular economy.

**Tom Huesman** graduated as a chemical engineer at the TU/e in 2001, following a PhD at the same university in fuel cell catalysis. He joined SABIC in 2006 where he held various positions being responsible for debottlenecking and troubleshooting of chemical plants all over the globe. In 2012 he was the project leader for SABIC's innovation branch of the strategic growth project Crude Oil to Chemicals. In 2017 his team completed the "Mixed plastic waste recycling" project, which resulted in SABIC's SPEAR (SABIC Plastics Energy Advanced Recycling) project. In the following years, Tom and his team shifted to circular solutions and decarbonization, with the BASF – SABIC JDA on the development of an electric cracking furnace. At the beginning of 2023, after nearly 17 inspiring years at SABIC, he accepted the Chief Technology Officer position for plastics recycling and scale up at Fuenix Ecogy in Weert.

**Sascha Kersten** studied chemical engineering at the University of Amsterdam. His master thesis dealt with the influence of recycle streams on the controllability of plants. After his master he worked at the ECN, the energy research foundation of The Netherlands. At ECN, his activities included: transient plant models, control, coal gasification, fuel cells and as last subject biomass gasification in circulating fluidized beds. On the latter he wrote a PhD thesis under the supervision of professor van Swaaij. In 2003 he moved to the University of Twente as coordinator of the biomass research and as assistant professor. In 2011 he was appointed full professor in Sustainable Process Technology at the same university. His current research interests are electrification of the petro and chemical industry, biofuels and biochemical, water cleaning and purification and methane to chemicals. Next to these contemporary problem areas he works on reactor selection and design methods. In 2018, Sascha Kersten was appointed scientific director of ISPT, the Dutch Institute of Sustainable Process Technology which includes all the Dutch technical universities and ca. 80 companies. He is co-founder of SuSTER BV, a private R&D company.